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# **MyGene.info Documentation**

***Release 3.0***

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# CHAPTER 1

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## Introduction

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MyGene.info provides simple-to-use REST web services to query/retrieve gene annotation data. It's designed with **simplicity** and **performance** emphasized. A typical use case is to use it to power a web application which requires querying genes and obtaining common gene annotations. For example, MyGene.info services are used to power BioGPS.



## CHAPTER 2

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### What's new in v3 API

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- Refseq accession number now contains version
- “ensembl”, “refseq” and “accession” contains associations between RNA and protein
- Better mapping between Ensembl and Entrez gene IDs
- JSON structure slightly changed
- and more bugfixes

You can read more details about this version on our [blog](#)

[Migration guide from v2 to v3 API](#)

Still want to stick with v2 API for a while? It's still there: [v2 API](#), but annotation data there won't be updated any more.





MyGene.info provides two simple web services: one for gene queries and the other for gene annotation retrieval. Both return results in [JSON](#) format.

## 3.1 Gene query service

### 3.1.1 URL

```
http://mygene.info/v3/query
```

### 3.1.2 Examples

```
http://mygene.info/v3/query?q=cdk2
http://mygene.info/v3/query?q=cdk2&species=human
http://mygene.info/v3/query?q=cdk?
http://mygene.info/v3/query?q=IL*
http://mygene.info/v3/query?q=entrezgene:1017
http://mygene.info/v3/query?q=ensemblgene:ENSG00000123374
http://mygene.info/v3/query?q=cdk2&fields=symbol,refseq
```

---

**Hint:** View nicely formatted JSON result in your browser with this handy add-on: [JSON formater](#) for Chrome or [JSONView](#) for Firefox.

---

### 3.1.3 To learn more

- You can read the full description of our query syntax [here](#).
- Try it live on [interactive API page](#).

- Play with our [demo applications](#).
- Batch queries? Yes, you can. do it with a [POST request](#).

## 3.2 Gene annotation service

### 3.2.1 URL

```
http://mygene.info/v3/gene/<geneid>
```

### 3.2.2 Examples

```
http://mygene.info/v3/gene/1017  
http://mygene.info/v3/gene/ENSG00000123374  
http://mygene.info/v3/gene/1017?fields=name,symbol,summary
```

“<geneid>” can be any of valid Entrez or Ensembl Gene ids. A retired Entrez Gene id works too if it is replaced by a new one.

### 3.2.3 To learn more

- You can read [the full description of our query syntax here](#).
- Try it live on [interactive API page](#).
- Play with our [demo applications](#).
- Yes, batch queries via [POST request](#) as well.

### 4.1 Migration from v2 API

Migrating from v2 API to v3 API is easy. Here's a summary of the changes. You may also want to read our [blog](#) for complementary information.

#### 4.1.1 URL change

You will need to access v3 API using “/v3” prefix for service urls:

##### Gene query service endpoint

**v2** `http://mygene.info/v2/query`

**v3** `http://mygene.info/v3/query`

##### Gene annotation service endpoint

**v2** `http://mygene.info/v2/gene`

**v3** `http://mygene.info/v3/gene`

#### 4.1.2 Returned Objects

There are several small changes in the returned data structure, as summarized here:

### Accession number with version

“**refseq**” and “**accession**” fields now contain accession number including version. Data can be search with and without version. Version is available for “*genomic*”, “*rna*” and “*protein*” accession number keys.

---

**Note:** “*genomic*” field is returned but is not searchable

---

**v2:** [http://mygene.info/v2/query?q=NM\\_052827&fields=refseq.rna](http://mygene.info/v2/query?q=NM_052827&fields=refseq.rna)

```
1 {
2   "hits": [
3     {
4       "_id": "1017",
5       "refseq": {
6         "rna": [
7           "NM_001290230",
8           "NM_001798",
9           "NM_052827",
10          "XM_011537732"
11        ]
12      }
13    }
14  ],
15  "max_score": 0.51962745,
16  "took": 3,
17  "total": 1
18 }
19 }
```

**v3:** [http://mygene.info/v3/query?q=NM\\_052827&fields=refseq.rna](http://mygene.info/v3/query?q=NM_052827&fields=refseq.rna)

```
1 {
2   "hits": [
3     {
4       "_id": "1017",
5       "_score": 10.052136,
6       "refseq": {
7         "rna": [
8           "NM_001290230.1",
9           "NM_001798.4",
10          "NM_052827.3",
11          "XM_011537732.1"
12        ]
13      }
14    }
15  ],
16  "total": 1,
17  "took": 14,
18  "max_score": 10.052136
19 }
```

### “translation” field for RNA-protein mapping

For “**ensembl**”, “**refseq**” and “**accession**” fields, a new sub-field name “*translation*” is now available. It gives the association between RNA and its protein product. v2 does not have this information in returned objects.

v3: [http://mygene.info/v3/query?q=NM\\_052827&fields=refseq.translation,refseq.rna,refseq.protein](http://mygene.info/v3/query?q=NM_052827&fields=refseq.translation,refseq.rna,refseq.protein)

```

1 {
2   "max_score": 10.052136,
3   "total": 1,
4   "hits": [
5     {
6       "_id": "1017",
7       "_score": 10.052136,
8       "refseq": {
9         "protein": [
10          "NP_001277159.1",
11          "NP_001789.2",
12          "NP_439892.2",
13          "XP_011536034.1"
14        ],
15        "rna": [
16          "NM_001290230.1",
17          "NM_001798.4",
18          "NM_052827.3",
19          "XM_011537732.1"
20        ],
21        "translation": [
22          {
23            "protein": "XP_011536034.1",
24            "rna": "XM_011537732.1"
25          },
26          {
27            "protein": "NP_001789.2",
28            "rna": "NM_001798.4"
29          },
30          {
31            "protein": "NP_439892.2",
32            "rna": "NM_052827.3"
33          },
34          {
35            "protein": "NP_001277159.1",
36            "rna": "NM_001290230.1"
37          }
38        ]
39      }
40    ]
41  },
42  "took": 4
43 }

```

### “exons” data structure modification

**Warning:** Backward-incompatible, data structure changed

“exons” field has two major modifications. It now contains a list of dictionary instead of a dictionary indexed by the accession number. This accession number is found within the dictionary under the key “*transcript*”. Finally, inner “exons” key has been rename to “*position*”.

v2: <http://mygene.info/v2/gene/1698?fields=exons>

```

1 {
2   "_id": "259236",
3   "exons": {
4     "NM_147196": {
5       "cdsstart": 46701487,
6       "cdsend": 46709688,
7       "txstart": 46701332,
8       "txend": 46710923,
9       "chr": "3",
10      "exons": [
11        [
12          46701332,
13          46701580
14        ],
15        [
16          46705789,
17          46705907
18        ],
19        [
20          46709125,
21          46709275
22        ],
23        [
24          46709578,
25          46710923
26        ]
27      ],
28      "strand": 1
29    }
30  }
31 }
32 }
33 }

```

v3: <http://mygene.info/v3/gene/1698?fields=exons>

```

1 {
2   "_id": "259236",
3   "_score": 21.732534,
4   "exons": [
5     {
6       "cdsend": 46709688,
7       "cdsstart": 46701487,
8       "chr": "3",
9       "position": [
10        [
11          46701332,
12          46701580
13        ],
14        [
15          46705789,
16          46705907
17        ],
18        [
19          46709125,
20          46709275
21        ],

```

(continues on next page)

(continued from previous page)

```

22     [
23         46709578,
24         46710923
25     ]
26 ],
27 "strand": 1,
28 "transcript": "NM_147196",
29 "txend": 46710923,
30 "txstart": 46701332
31 }
32 ]
33 }

```

### “dotfield” notation default changed

**Warning:** May be backward-incompatible, default data structure changed (but can be restored with “dotfield” parameter setting)

By default, “dotfield” notation is now disabled for gene annotation endpoint in v3 (/gene). It’s enabled by default in v2. You will need to explicitly pass “dotfield=1” to your queries to have the same behavior as v2.

**Note:** “dotfield” notation is disabled by default for gene query endpoint (/gene) in both v2 and v3

**v2:** <http://mygene.info/v2/gene/1017?fields=refseq.rna>

```

1 {
2
3   "_id": "1017",
4   "refseq.rna": [
5     "NM_001290230",
6     "NM_001798",
7     "NM_052827",
8     "XM_011537732"
9   ]
10
11 }
12 }

```

**v3:** <http://mygene.info/v3/gene/1017?fields=refseq.rna>

```

1 {
2   "_id": "1017",
3   "_score": 21.731894,
4   "refseq": {
5     "rna": [
6       "NM_001290230.1",
7       "NM_001798.4",
8       "NM_052827.3",
9       "XM_011537732.1"
10    ]
11  }
12 }

```

## Querying “reporter” data source

“reporter” data now has to be queried explicitly, prefixing the query term by “reporter:”

v3: <http://mygene.info/v3/query?q=reporter:2845421&fields=reporter>

## 4.2 Gene annotation data

### 4.2.1 Data sources

We currently obtain the gene annotation data from several public data resources and keep them up-to-date, so that you don’t have to do it:

| Source      | Update frequency                    | Notes  |
|-------------|-------------------------------------|--|
| NCBI Entrez | weekly snapshot                     |  |
| Ensembl     | whenever a new release is available | Ensembl Pre! and EnsemblGenomes are not included at the moment |
| Uniprot     | whenever a new release is available |  |
| NetAffx     | whenever a new release is available | For “reporter” field   |
| PharmGKB    | whenever a new release is available |  |
| UCSC        | whenever a new release is available | For “exons” field  |
| CPDB        | whenever a new release is available | For “pathway” field  |

The most updated data information can be accessed [here](#).

### 4.2.2 Gene object

Gene annotation data are both stored and returned as a gene object, which is essentially a collection of fields (attributes) and their values:

```
{
  "_id": "1017",
  "_score": 20.4676,
  "taxid": 9606,
  "symbol": "CDK2",
  "entrezgene": 1017,
  "name": "cyclin-dependent kinase 2",
  "genomic_pos": {
    "start": 55966769,
    "chr": "12",
    "end": 55972784,
    "strand": 1
  }
}
```

The example above omits most of available fields. For a full example, you can just check out a few gene examples: [CDK2](#), [ADA](#). Or, did you try our [interactive API page](#) yet?



### 4.2.3 `_id` field

Each individual gene object contains an “`_id`” field as the primary key. The value of the “`_id`” field is the NCBI gene ID (the same as “`entrezgene`” field, but as a string) if available for a gene object, otherwise, Ensembl gene ID is used (e.g. those Ensembl-only genes). Here is [an example](#). We recommend to use “`entrezgene`” field for the NCBI gene ID, and “`ensembl.gene`” field for Ensembl gene ID, instead of using “`_id`” field.

---

**Note:** Regardless how the value of the “`_id`” field looks like, either NCBI gene ID or Ensembl gene ID always works for our gene annotation service `/v3/gene/<geneid>`.

---

### 4.2.4 `_score` field

You will often see a “`_score`” field in the returned gene object, which is the internal score representing how well the query matches the returned gene object. It probably does not mean much in [gene annotation service](#) when only one gene object is returned. In [gene query service](#), by default, the returned gene hits are sorted by the scores in descending order.

### 4.2.5 Species

We support **ALL** species annotated by NCBI and Ensembl. All of our services allow you to pass a “`species`” parameter to limit the query results. “`species`” parameter accepts taxonomy ids as the input. You can look for the taxonomy ids for your favorite species from [NCBI Taxonomy](#).

For convenience, we allow you to pass these *common names* for commonly used species (e.g. “`species=human,mouse,rat`”):

| Common name | Genus name              | Taxonomy id |
|-------------|-------------------------|-------------|
| human       | Homo sapiens            | 9606        |
| mouse       | Mus musculus            | 10090       |
| rat         | Rattus norvegicus       | 10116       |
| fruitfly    | Drosophila melanogaster | 7227        |
| nematode    | Caenorhabditis elegans  | 6239        |
| zebrafish   | Danio rerio             | 7955        |
| thale-cress | Arabidopsis thaliana    | 3702        |
| frog        | Xenopus tropicalis      | 8364        |
| pig         | Sus scrofa              | 9823        |

If needed, you can pass “`species=all`” to query against all available species, although, we recommend you to pass specific species you need for faster response.

### 4.2.6 Genome assemblies

Our [gene query service](#) supports [genome interval queries](#). We import genomic location data from Ensembl, so all species available there are supported. You can find the their reference genome assemblies information [here](#).

This table lists the genome assemblies for commonly-used species:

| Common name | Genus name              | Genome assembly                  |
|-------------|-------------------------|----------------------------------|
| human       | Homo sapiens            | GRCh38 (hg38), also support hg19 |
| mouse       | Mus musculus            | GRCm38 (mm10), also support mm9  |
| rat         | Rattus norvegicus       | Rnor_6.0 (rn6)                   |
| fruitfly    | Drosophila melanogaster | BDBG6 (dm6)                      |
| nematode    | Caenorhabditis elegans  | WBcel235 (ce11)                  |
| zebrafish   | Danio rerio             | GRCz10 (danRer10)                |
| frog        | Xenopus tropicalis      | JGI_7.0 (xenTro7)                |
| pig         | Sus scrofa              | Sscrofa10.2 (susScr3)            |

### 4.2.7 Available fields

The table below lists of all of the possible fields that could be in a gene object.

## 4.3 Data release notes

This page contains metadata about each MyGene.info data release. Click a link to see more.

### 4.3.1 MyGene Releases

## 4.4 Gene query service

This page describes the reference for MyGene.info gene query web service. It's also recommended to try it live on our [interactive API page](#).

### 4.4.1 Service endpoint

```
http://mygene.info/v3/query
```

### 4.4.2 GET request

#### Query parameters

##### q

Required, passing user query. The detailed query syntax for parameter “q” we explained *below*.

##### fields

Optional, can be a comma-separated fields to limit the fields returned from the matching gene hits. The supported field names can be found from any gene object (e.g. [gene 1017](#)). Note that it supports dot notation as well, e.g., you can pass “refseq.rna”. If “fields=all”, all available fields will be returned. Default: “symbol,name,taxid,entrezgene”.

## species

Optional, can be used to limit the gene hits from given species. You can use “common names” for nine common species (human, mouse, rat, fruitfly, nematode, zebrafish, thale-cress, frog and pig). All other species, you can provide their taxonomy ids. See [more details here](#). Multiple species can be passed using comma as a separator. Passing “all” will query against all available species. Default: all.

## size

Optional, the maximum number of matching gene hits to return (with a cap of 1000 at the moment). Default: 10.

## from

Optional, the number of matching gene hits to skip, starting from 0. Default: 0

---

**Hint:** The combination of “**size**” and “**from**” parameters can be used to get paging for large query:

---

|   |                  |
|---|------------------|
| <code>q=cdk*&amp;size=50</code>             | first 50 hits    |
| <code>q=cdk*&amp;size=50&amp;from=50</code> | the next 50 hits |

## fetch\_all

Optional, a boolean, which when TRUE, allows fast retrieval of all unsorted query hits. The return object contains a `_scroll_id` field, which when passed as a parameter to the query endpoint, returns the next 1000 query results. Setting `fetch_all = TRUE` causes the results to be inherently unsorted, therefore the `sort` parameter is ignored. For more information see [examples using fetch\\_all here](#). Default: FALSE.

## scroll\_id

Optional, a string containing the `_scroll_id` returned from a query request with `fetch_all = TRUE`. Supplying a valid `scroll_id` will return the next 1000 unordered results. If the next results are not obtained within 1 minute of the previous set of results, the `scroll_id` becomes stale, and a new one must be obtained with another query request with `fetch_all = TRUE`. All other parameters are ignored when the `scroll_id` parameter is supplied. For more information see [examples using scroll\\_id here](#).

## sort

Optional, the comma-separated fields to sort on. Prefix with “-” for descending order, otherwise in ascending order. Default: sort by matching scores in descending order.

## facets

Optional, a single field or comma-separated fields to return facets, for example, “`facets=taxid`”, “`facets=taxid,type_of_gene`”. See [examples of faceted queries here](#).

### facet\_size

Optional, an integer ( $1 \leq \text{facet\_size} \leq 1000$ ) that specifies how many buckets to return in a faceted query.

### species\_facet\_filter

Optional, relevant when faceting on species (i.e., “facets=taxid” are passed). It’s used to pass species filter without changing the scope of faceting, so that the returned facet counts won’t change. Either species name or taxonomy id can be used, just like “*species*” parameter above. See *examples of faceted queries here*.

### entrezonly

Optional, when passed as “true” or “1”, the query returns only the hits with valid Entrez gene ids. Default: false.

### ensemblonly

Optional, when passed as “true” or “1”, the query returns only the hits with valid Ensembl gene ids. Default: false.

### callback

Optional, you can pass a “**callback**” parameter to make a JSONP call.

### dotfield

Optional, can be used to control the format of the returned gene object. If “dotfield” is true, the returned data object is returned flattened (no nested objects) using dotfield notation for key names. Default: false.

### filter

Alias for “fields” parameter.

### limit

Alias for “size” parameter.

### skip

Alias for “from” parameter.

## email

Optional, if you are regular users of our services, we encourage you to provide us an email, so that we can better track the usage or follow up with you.

## Query syntax

Examples of query parameter “q”:

### Simple queries

search for everything:

|                             |   |
|-----------------------------|---|
| q=cdk2                      | search <b>for</b> any fields                |
| q=tumor suppressor          | default <b>as "AND" for</b> all query terms |
| q="cyclin-dependent kinase" | search <b>for</b> the phrase                |

### Fielded queries

```
q=entrezgene:1017
q=symbol:cdk2
q=refseq:NM_001798
```

### Available fields

This table lists some commonly used fields can be used for “fielded queries”. [Check here](#) for the complete list of available fields.

| Field                     | Description                            | Examples                                 |
|---------------------------|--|--|
| <b>entrezgene</b>         | Entrez gene id                         | q=entrezgene:1017                        |
| <b>ensembl.gene</b>       | Ensembl gene id                        | q=ensembl.gene:ENSG00000123374           |
| <b>symbol</b>             | official gene symbol                   | q=symbol:cdk2                            |
| <b>name</b>               | gene name                              | q=name:cyclin-dependent                  |
| <b>alias</b>              | gene alias                             | q=alias:p33                              |
| <b>summary</b>            | gene summary text                      | q=summary:insulin                        |
| <b>refseq</b>             | NCBI RefSeq id (both rna and proteins) | q=refseq:NM_001798<br>q=refseq:NP_439892 |
| <b>unigene</b>            | NCBI UniGene id                        | q=unigene:Hs.19192                       |
| <b>homologene</b>         | NCBI HomoloGene id                     | q=homologene:74409                       |
| <b>accession</b>          | NCBI GeneBank Accession number         | q=accession:AA810989                     |
| <b>ensembl.transcript</b> | Ensembl transcript id                  | q=ensembl.transcript:ENST00000266970     |
| <b>ensembl.protein</b>    | Ensembl protein id                     | q=ensembl.protein:ENSP00000243067        |
| <b>uniprot</b>            | UniProt id                             | q=uniprot:P24941                         |
| <b>ipi</b> (deprecated!)  | IPI id                                 | q=ipi:IPI00031681                        |
| <b>pdb</b>                | PDB id                                 | q=pdb:1AQ1                               |
| <b>prosite</b>            | Prosite id                             | q=prosite:PS50011                        |
| <b>pfam</b>               | PFam id                                | q=pfam:PF00069                           |

Continued on next page

Table 1 – continued from previous page

| Field           | Description   | Examples                                     |
|-----------------|---|--|
| <b>interpro</b> | InterPro id   | q=interpro:IPR008351                         |
| <b>mim</b>      | OMIM id   | q=mim:116953                                 |
| <b>pharmgkb</b> | PharmGKB id   | q=pharmgkb:PA101                             |
| <b>reporter</b> | Affymetrix probeset id  | q=reporter:204252_at                         |
| <b>reagent</b>  | GNF reagent id  | q=reagent:GNF282834                          |
| <b>go</b>       | Gene Ontology id  | q=go:0000307                                 |
| <b>hgnc</b>     | HUGO Gene Nomenclature Committee                                    | q=hgnc:1771                                  |
| <b>hprd</b>     | Human Protein Reference Database                                    | q=hprd:00310                                 |
| <b>mgi</b>      | Mouse Genome Informatics  | q=mgi:MGI:88339                              |
| <b>rgd</b>      | Rat Genome Database   | q=rgd:620620                                 |
| <b>flybase</b>  | A Database of Drosophila Genes & Genomes                            | q=flybase:FBgn0004107&species=fruitfly       |
| <b>wormbase</b> | C elegans and related nematodes database                            | q=wormbase:WBGene00057218&species=31234      |
| <b>zfin</b>     | Zebrafish Information Network                                       | q=zfin:ZDB-GENE-980526-104&species=zebrafish |
| <b>tair</b>     | Arabidopsis Information Resource                                    | q=tair:AT3G48750&species=thalecress          |
| <b>xenbase</b>  | Xenopus laevis and Xenopus tropicalis biology and genomics resource | q=xenbase:XB-GENE-1001990&species=frog       |
| <b>mirbase</b>  | database of published miRNA sequences and annotation                | q=mirbase:MI0017267                          |
| <b>retired</b>  | Retired Entrez gene id, including those with replaced gene ids.     | q=retired:84999                              |

## Genome interval query

When we detect your query (“q” parameter) contains a genome interval pattern like this one:

```
chrX:151,073,054-151,383,976
```

we will do the genome interval query for you. Besides above interval string, you also need to specify “species” parameter (with the default as human). These are all accepted queries:

```
q=chrX:151073054-151383976&species:9606
q=chrX:151,073,054-151,383,976&species:human
```

**Hint:** As you can see above, the genomic locations can include commas in it.

**See also:**

Genome assembly information

## Wildcard queries

Wildcard character “\*” or “?” is supported in either simple queries or fielded queries:

|               |   |
|---------------|---|
| q=CDK?        | single character wildcard                       |
| q=symbol:CDK? | single character wildcard within "symbol" field |
| q=IL*R        | multiple character wildcard                     |

**Note:** Wildcard character can not be the first character. It will be ignored.

## Boolean operators and grouping

You can use **AND/OR/NOT** boolean operators and grouping to form complicated queries:

|   |                        |
|---|------------------------|
| q=tumor AND suppressor                  | AND operator           |
| q=CDK2 OR BTK                           | OR operator            |
| q="tumor suppressor" NOT receptor       | NOT operator           |
| q=(interleukin OR insulin) AND receptor | the use of parentheses |

## Returned object

A GET request like this:

```
http://mygene.info/v3/query?q=symbol:cdk2
```

should return hits as:

```
{
  "hits": [
    {
      "name": "cyclin-dependent kinase 2",
      "_score": 87.76775,
      "symbol": "CDK2",
      "taxid": 9606,
      "entrezgene": 1017,
      "_id": "1017"
    },
    {
      "name": "cyclin-dependent kinase 2",
      "_score": 79.480484,
      "symbol": "Cdk2",
      "taxid": 10090,
      "entrezgene": 12566,
      "_id": "12566"
    },
    {
      "name": "cyclin dependent kinase 2",
      "_score": 62.286797,
      "symbol": "Cdk2",

```

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```

    "taxid": 10116,
    "entrezgene": 362817,
    "_id": "362817"
  }
],
"total": 3,
"max_score": 87.76775,
"took": 4
}

```

## Faceted queries

If you need to perform a faceted query, you can pass an optional “*facets*” parameter. For example, if you want to get the facets on species, you can pass “*facets=taxid*”:

A GET request like this:

```
http://mygene.info/v3/query?q=cdk2&size=1&facets=taxid
```

should return hits as:

```

{
  "hits": [
    {
      "entrezgene": 1017,
      "name": "cyclin-dependent kinase 2",
      "_score": 400.43347,
      "symbol": "CDK2",
      "_id": "1017",
      "taxid": 9606
    }
  ],
  "total": 26,
  "max_score": 400.43347,
  "took": 7,
  "facets": {
    "taxid": {
      "_type": "terms",
      "total": 26,
      "terms": [
        {
          "count": 14,
          "term": 9606
        },
        {
          "count": 7,
          "term": 10116
        },
        {
          "count": 5,
          "term": 10090
        }
      ]
    },
    "other": 0,
    "missing": 0
  }
}

```

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```

    }
  }
}

```

Another useful field to get facets on is “type\_of\_gene”:

```
http://mygene.info/v3/query?q=cdk2&size=1&facets=type_of_gene
```

It should return hits as:

```

{
  "hits": [
    {
      "entrezgene": 1017,
      "name": "cyclin-dependent kinase 2",
      "_score": 400.43347,
      "symbol": "CDK2",
      "_id": "1017",
      "taxid": 9606
    }
  ],
  "total": 26,
  "max_score": 400.43347,
  "took": 97,
  "facets": {
    "type_of_gene": {
      "_type": "terms",
      "total": 26,
      "terms": [
        {
          "count": 20,
          "term": "protein-coding"
        },
        {
          "count": 6,
          "term": "pseudo"
        }
      ]
    },
    "other": 0,
    "missing": 0
  }
}

```

If you need to, you can also pass multiple fields as comma-separated list:

```
http://mygene.info/v3/query?q=cdk2&size=1&facets=taxid,type_of_gene
```

Particularly relevant to species facets (i.e., “facets=taxid”), you can pass a “*species\_facet\_filter*” parameter to filter the returned hits on a given species, without changing the scope of the facets (i.e. facet counts will not change). This is useful when you need to get the subset of the hits for a given species after the initial faceted query on species.

You can see the different “hits” are returned in the following queries, while “facets” keeps the same:

```
http://mygene.info/v3/query?q=cdk?&size=1&facets=taxid&species_facet_filter=human
```

v.s.

```
http://mygene.info/v3/query?q=cdk?&size=1&facets=taxid&species_facet_filter=mouse
```

### Scrolling queries

If you want to return ALL results of a very large query (>10,000 results), sometimes the paging method described *above* can take too long. In these cases, you can use a scrolling query. This is a two-step process that turns off database sorting to allow very fast retrieval of all query results. To begin a scrolling query, you first call the query endpoint as you normally would, but with an extra parameter **fetch\_all** = TRUE. For example, a GET request to:

```
http://mygene.info/v3/query?q=brain&fetch_all=TRUE
```

Returns the following object:

```
{
  "_scroll_id":
  ↪ "cXVlcnlUaGVuRmV0Y2g7MTA7MjA1NjY1MzMwO19HM29rRkg2VFZ5S1c3cTJtYkI4RHc7MjA1NjY1MjY3O1M0V1VCa194UWdLY",
  ↪ ",
  "max_score": 13.958638,
  "took": 270,
  "total": 14571,
  "hits": [
    {
      "_id": "390259",
      "_score": 13.958638,
      "entrezgene": 390259,
      "name": "brain specific homeobox",
      "symbol": "BSX",
      "taxid": 9606
    },
    .
    .
  ]
}
```

At this point, the first 1000 hits have been returned (of ~14,000 total), and a scroll has been set up for your query. To get the next batch of 1000 unordered results, simply execute a GET request to the following address, supplying the **\_scroll\_id** from the first step into the **scroll\_id** parameter in the second step:

```
http://mygene.info/v3/query?scroll_
↪ id=cXVlcnlUaGVuRmV0Y2g7MTA7MjA1NjY1MzMwO19HM29rRkg2VFZ5S1c3cTJtYkI4RHc7MjA1NjY1MjY3O1M0V1VCa194UWdLY
```

---

**Hint:** Your scroll will remain active for 1 minute from the last time you requested results from it. If your scroll expires before you get the last batch of results, you must re-request the scroll\_id by setting **fetch\_all** = TRUE as in step 1.

---

### 4.4.3 Batch queries via POST

Although making simple GET requests above to our gene query service is sufficient in most of use cases, there are some cases you might find it's more efficient to make queries in a batch (e.g., retrieving gene annotation for multiple genes). Fortunately, you can also make batch queries via POST requests when you need:

```
URL: http://mygene.info/v3/query
HTTP method: POST
```

## Query parameters

### q

Required, multiple query terms separated by comma (also support “+” or white space), but no wildcard, e.g., ‘q=1017,1018’ or ‘q=CDK2+BTK’

### scopes

Optional, specify one or more fields (separated by comma) as the search “scopes”, e.g., “scopes=entrezgene”, “scopes=entrezgene,ensemblgene”. The available “fields” can be passed to “scopes” parameter are *listed above*. Default: “scopes=entrezgene,ensemblgene,retired” (either Entrez or Ensembl gene ids).

### species

Optional, can be used to limit the gene hits from given species. You can use “common names” for nine common species (human, mouse, rat, fruitfly, nematode, zebrafish, thale-cress, frog and pig). All other species, you can provide their taxonomy ids. See [more details here](#). Multiple species can be passed using comma as a separator. Default: all.

### fields

Optional, can be a comma-separated fields to limit the fields returned from the matching gene hits. The supported field names can be found from any gene object (e.g. [gene 1017](#)). Note that it supports dot notation as well, e.g., you can pass “refseq.rna”. If “fields=all”, all available fields will be returned. Default: “symbol,name,taxid,entrezgene”.

### dotfield

Optional, can be used to control the format of the returned fields when passed “fields” parameter contains dot notation, e.g. “fields=refseq.rna”. If “dotfield” is true, the returned data object contains a single “refseq.rna” field, otherwise, a single “refseq” field with a sub-field of “rna”. Default: false.

### email

Optional, if you are regular users of our services, we encourage you to provide us an email, so that we can better track the usage or follow up with you.

## Example code

Unlike GET requests, you can easily test them from browser, make a POST request is often done via a piece of code. Here is a sample python snippet:

```
import requests
headers = {'content-type': 'application/x-www-form-urlencoded'}
params = 'q=1017,1018&scopes=entrezgene&fields=name,symbol,taxid,entrezgene'
res = requests.post('http://mygene.info/v3/query', data=params, headers=headers)
```

## Returned object

Returned result (the value of “res.text” variable above) from above example code should look like this:

```
[
  {
    '_id': '1017',
    '_score': 22.757837,
    'entrezgene': 1017,
    'name': 'cyclin dependent kinase 2',
    'query': '1017',
    'symbol': 'CDK2',
    'taxid': 9606
  },
  {
    '_id': '1018',
    '_score': 22.757782,
    'entrezgene': 1018,
    'name': 'cyclin dependent kinase 3',
    'query': '1018',
    'symbol': 'CDK3',
    'taxid': 9606
  }
]
```

---

**Tip:** “query” field in returned object indicates the matching query term.

---

---

**Note:** if no “fields” parameter is specified, all available fields will be returned

---

If a query term has no match, it will return with “**notfound**” field as “**true**”:

```
params = 'q=1017,dummy&scopes=entrezgene&fields=name,symbol,taxid,entrezgene'
res = requests.post('http://mygene.info/v3/query', data=params, headers=headers)
```

```
[
  {
    "name": "cyclin-dependent kinase 2",
    "symbol": "CDK2",
    "taxid": 9606,
    "entrezgene": 1017,
    "query": "1017",
    "_id": "1017"
  },
  {
    "query": "dummy",
    "notfound": true
  }
]
```

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```
}
]
```

If a query term has multiple matches, they will be included with the same “query” field:

```
params = 'q=tp53,1017&scopes=symbol,entrezgene&fields=name,symbol,taxid,entrezgene'
res = requests.post('http://mygene.info/v3/query', data=params, headers=headers)
```

```
[
  {
    "name": "tumor protein p53",
    "symbol": "TP53",
    "taxid": 9606,
    "entrezgene": 7157,
    "query": "tp53",
    "_id": "7157"
  },
  {
    "name": "tumor protein p53",
    "symbol": "Tp53",
    "taxid": 10116,
    "entrezgene": 24842,
    "query": "tp53",
    "_id": "24842"
  },
  {
    "name": "cyclin-dependent kinase 2",
    "symbol": "CDK2",
    "taxid": 9606,
    "entrezgene": 1017,
    "query": "1017",
    "_id": "1017"
  }
]
```

## 4.5 Gene annotation service

This page describes the reference for MyGene.info gene annotation web service. It’s also recommended to try it live on our [interactive API page](#).

### 4.5.1 Service endpoint

```
http://mygene.info/v3/gene
```

### 4.5.2 GET request

To obtain the gene annotation via our web service is as simple as calling this URL:

```
http://mygene.info/v3/gene/<geneid>
```

**geneid** above can be either Entrez gene id (“1017”) or Ensembl gene id (“ENSG00000123374”). By default, this will return the complete gene annotation object in JSON format. See [here](#) for an example and [here](#) for more details. If the input **geneid** is not valid, 404 (NOT FOUND) will be returned.

---

**Hint:** A retired Entrez gene id works too if it is replaced by a new one, e.g., [245794](#). But a “*discontinued*” gene id will not return any hit, e.g., [138](#).

---

Optionally, you can pass a “**fields**” parameter to return only the annotation you want (by filtering returned object fields):

```
http://mygene.info/v3/gene/1017?fields=name,symbol
```

“**fields**” accepts any attributes (a.k.a fields) available from the gene object. Multiple attributes should be separated by commas. If an attribute is not available for a specific gene object, it will be ignored. Note that the attribute names are case-sensitive.

Just like [gene query service](#), you can also pass a “**callback**” parameter to make a [JSONP](#) call.

### Query parameters

#### fields

Optional, can be a comma-separated fields to limit the fields returned from the gene object. If “fields=all”, all available fields will be returned. Note that it supports dot notation as well, e.g., you can pass “refseq.rna”. Default: “fields=all”.

#### callback

Optional, you can pass a “**callback**” parameter to make a [JSONP](#) <<http://ajaxian.com/archives/jsonp-json-with-padding>> call.

#### filter

Alias for “fields” parameter.

#### dotfield

Optional, can be used to control the format of the returned fields when passed “fields” parameter contains dot notation, e.g. “fields=refseq.rna”. If “dotfield” is true, the returned data object contains a single “refseq.rna” field, otherwise, a single “refseq” field with a sub-field of “rna”. Default: false.

#### email

Optional, if you are regular users of our services, we encourage you to provide us an email, so that we can better track the usage or follow up with you.

## Returned object

A GET request like this:

```
http://mygene.info/v3/gene/1017
```

should return a gene object below:

```
{
  "HGNC": "1771",
  "HPRD": "00310",
  "MIM": "116953",
  "Vega": "OTTHUMG00000170575",
  "_id": "1017",
  "_score": 21.731894,
  "accession": {
    "genomic": [
      "AC025162.48",
      "AC034102.32",
      "AF512553.1",
      "AJ223951.1",
      "AMYH02026556.1",
      "AMYH02026557.1",
      "CH471054.1",
      "KT584459.1",
      "NC_000012.12",
      "NC_018923.2",
      "NG_034014.1",
      "U50730.2"
    ],
    "protein": [
      "AAA35667.1",
      "AAH03065.1",
      "AAM34794.1",
      "AAP35467.1",
      "ABM84693.1",
      "ABM92215.1",
      "BAA32794.1",
      "BAF84630.1",
      "BAG56780.1",
      "CAA43807.1",
      "CAA43985.1",
      "CAL38014.1",
      "EAW96856.1",
      "EAW96857.1",
      "EAW96858.1",
      "EAW96859.1",
      "EAW96860.1",
      "NP_001277159.1",
      "NP_001789.2",
      "NP_439892.2",
      "P24941.2",
      "XP_011536034.1"
    ],
    "rna": [
      "AA789250.1",
      "AA810989.1",
      "AB012305.1",

```

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```
"AK291941.1",
"AK293246.1",
"AM393136.1",
"BC003065.2",
"BJ991087.1",
"BT006821.1",
"DA814453.1",
"DQ890598.2",
"DQ893767.2",
"M68520.1",
"NM_001290230.1",
"NM_001798.4",
"NM_052827.3",
"X61622.1",
"X62071.1",
"XM_011537732.1"
],
"translation": [
  {
    "protein": "BAA32794.1",
    "rna": "AB012305.1"
  },
  {
    "protein": "XP_011536034.1",
    "rna": "XM_011537732.1"
  },
  {
    "protein": "ABM92215.1",
    "rna": "DQ890598.2"
  },
  {
    "protein": "NP_439892.2",
    "rna": "NM_052827.3"
  },
  {
    "protein": "AAA35667.1",
    "rna": "M68520.1"
  },
  {
    "protein": "BAG56780.1",
    "rna": "AK293246.1"
  },
  {
    "protein": "BAF84630.1",
    "rna": "AK291941.1"
  },
  {
    "protein": "AAP35467.1",
    "rna": "BT006821.1"
  },
  {
    "protein": "CAA43807.1",
    "rna": "X61622.1"
  },
  {
    "protein": "CAL38014.1",
    "rna": "AM393136.1"
  }
]
```

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```

    },
    {
      "protein": "CAA43985.1",
      "rna": "X62071.1"
    },
    {
      "protein": "AAH03065.1",
      "rna": "BC003065.2"
    },
    {
      "protein": "NP_001789.2",
      "rna": "NM_001798.4"
    },
    {
      "protein": "NP_001277159.1",
      "rna": "NM_001290230.1"
    },
    {
      "protein": "ABM84693.1",
      "rna": "DQ893767.2"
    }
  ]
},
"alias": [
  "CDKN2",
  "p33 (CDK2)"
],
"ec": "2.7.11.22",
"ensembl": {
  "gene": "ENSG00000123374",
  "protein": [
    "ENSP00000243067",
    "ENSP00000266970",
    "ENSP00000393605",
    "ENSP00000450983",
    "ENSP00000452138",
    "ENSP00000452514"
  ],
  "transcript": [
    "ENST00000266970",
    "ENST00000354056",
    "ENST00000440311",
    "ENST00000553376",
    "ENST00000554545",
    "ENST00000554619",
    "ENST00000555357",
    "ENST00000555408",
    "ENST00000556146",
    "ENST00000556276",
    "ENST00000556464",
    "ENST00000556656"
  ],
  "translation": [
    {
      "protein": "ENSP00000266970",
      "rna": "ENST00000266970"
    }
  ],

```

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```

    {
      "protein": "ENSP00000450983",
      "rna": "ENST00000555408"
    },
    {
      "protein": "ENSP00000452514",
      "rna": "ENST00000553376"
    },
    {
      "protein": "ENSP00000393605",
      "rna": "ENST00000440311"
    },
    {
      "protein": "ENSP00000452138",
      "rna": "ENST00000555357"
    },
    {
      "protein": "ENSP00000243067",
      "rna": "ENST00000354056"
    }
  ]
},
"entrezgene": 1017,
"exons": [
  {
    "cdsend": 55971625,
    "cdsstart": 55967008,
    "chr": "12",
    "position": [
      [
        55966768,
        55967124
      ],
      [
        55968048,
        55968169
      ],
      [
        55968777,
        55968948
      ],
      [
        55971043,
        55971247
      ],
      [
        55971520,
        55972789
      ]
    ],
    "strand": 1,
    "transcript": "NM_001290230",
    "txend": 55972789,
    "txstart": 55966768
  },
  {
    "cdsend": 55971625,

```

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```

"cdsstart": 55967008,
"chr": "12",
"position": [
  [
    55966768,
    55967124
  ],
  [
    55967856,
    55967934
  ],
  [
    55968048,
    55968169
  ],
  [
    55968777,
    55968948
  ],
  [
    55969474,
    55969576
  ],
  [
    55971043,
    55971247
  ],
  [
    55971520,
    55972789
  ]
],
"strand": 1,
"transcript": "NM_001798",
"txend": 55972789,
"txstart": 55966768
},
{
"cdsend": 55971625,
"cdsstart": 55967008,
"chr": "12",
"position": [
  [
    55966768,
    55967124
  ],
  [
    55967856,
    55967934
  ],
  [
    55968048,
    55968169
  ],
  [
    55968777,
    55968948

```

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```
    ],
    [
      55971043,
      55971247
    ],
    [
      55971520,
      55972789
    ]
  ],
  "strand": 1,
  "transcript": "NM_052827",
  "txend": 55972789,
  "txstart": 55966768
}
],
"exons_hg19": [
  {
    "cdsend": 56365409,
    "cdsstart": 56360792,
    "chr": "12",
    "position": [
      [
        56360552,
        56360908
      ],
      [
        56361832,
        56361953
      ],
      [
        56362561,
        56362732
      ],
      [
        56364827,
        56365031
      ],
      [
        56365304,
        56366573
      ]
    ],
    "strand": 1,
    "transcript": "NM_001290230",
    "txend": 56366573,
    "txstart": 56360552
  },
  {
    "cdsend": 56365409,
    "cdsstart": 56360792,
    "chr": "12",
    "position": [
      [
        56360552,
        56360908
      ],

```

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```

    [
      56361640,
      56361718
    ],
    [
      56361832,
      56361953
    ],
    [
      56362561,
      56362732
    ],
    [
      56363258,
      56363360
    ],
    [
      56364827,
      56365031
    ],
    [
      56365304,
      56366573
    ]
  ],
  "strand": 1,
  "transcript": "NM_001798",
  "txend": 56366573,
  "txstart": 56360552
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↪involves accumulation of p27, down-regulation of pRb, Skp2, and impairment of Cdk2_
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    {
      "pubmed": 19703905,
      "text": "cyclin A/cdk2-dependent phosphorylation of APC affects astral_
↪microtubule attachment to the cortical surface in mitosis"
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      "pubmed": 19706521,
      "text": "Results suggest that simple but robust rules encoded in the CDK2_
↪structure play a dominant role in predefining the mechanisms of ligand binding,_
↪which may be advantageously exploited in designing inhibitors."
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    {
      "pubmed": 19723060,
      "text": "Studies indicate that roscovitine arrests the cell cycle is direct_
↪inhibition of CDK1, a mitotic regulator, and CDK2, involved in G1/S transition."
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      "pubmed": 19724860,
      "text": "Overexpression of Notch1 in laryngeal carcinoma cell line was coupled_
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      "pubmed": 19738611,
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      "pubmed": 19822658,
      "text": "Results underscore the crucial role of cyclin A2-CDK2 in regulating_
↪the PLK1-SCF(beta-TrCP1)-EMI1-APC/C axis and CDC6 to trigger genome reduplication_
↪after the activity of CDK1 is suppressed."
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    {
      "pubmed": 19829063,
      "text": "Since CAC1 interacts with CDK2 and promotes the kinase activity of_
↪CDK2 protein, we propose that CAC1 is a novel cell cycle associated protein capable_
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  "text": "Data show that SHP-1 knockdown increases p27stability, decreases the_
↪CDK6 levels, inducing retinoblastoma protein hypophosphorylation, downregulation of_
↪cyclin E and thereby a decrease in the CDK2 activity."
},
{
  "pubmed": 19854217,
  "text": "expression upregulation is critical for TLR9-stimulated proliferation_
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},
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  "pubmed": 19858290,
  "text": "Export was also reduced by Cdk inhibition or cyclin A RNA interference,
↪ suggesting that cyclin A/Cdk complexes contribute to Wee1 export."
},
{
  "pubmed": 19885547,
  "text": "aberrant regulation of S100P in HCC might activate cyclin D1 and CDK_
↪expression and contribute to the mitogenic potential of tumor cells during_
↪Hepatocellular carcinoma carcinogenesis."
},
{
  "pubmed": 19960406,
  "text": "Cellular production of IGFBP-3 leads to G1 cell cycle arrest with_
↪inhibition of CDK2 and CDK4."
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{
  "pubmed": 19966300,
  "text": "Data show that Myc repressed Ras-induced senescence, and that Cdk2_
↪interacted with Myc at promoters, where it affected Myc-dependent regulation of_
↪genes, including those of proteins known to control senescence."
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{
  "pubmed": 20017906,
  "text": "FUS-DDIT3 and the normal DDIT3 bind CDK2."
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  "pubmed": 20062077,
  "text": "Results directly show that the inhibition of Cdk1 activity and the_
↪persistence of Cdk2 activity in G2 cells induces endoreplication without mitosis."
},
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  "pubmed": 20068231,
  "text": "Results show that most of the up-regulated sites phosphorylated by_
↪cyclin-dependent CDK1 or CDK2 were almost fully phosphorylated in mitotic cells."
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  "text": "the nitric oxide-mediated biphasic effect was dependent on Cdk2_
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  "pubmed": 20195506,
  "text": "These findings demonstrate that Cdk2 maintains a balance of S-phase
↳regulatory proteins and thereby coordinates subsequent p53-independent G(2)/M
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  "pubmed": 20399812,
  "text": "Data describe the properties of a mutant form of Cdk2 identified
↳during large-scale sequencing of protein kinases from cancerous tissue."
},
{
  "pubmed": 20422243,
  "text": "Triticum aestivum-5B2 (( Ta ) 5B2) is suggested to be a wheat analogue
↳of human CDK2 enzyme."
},
{
  "pubmed": 20444741,
  "text": "Conclude that cisplatin likely activates both caspase-dependent and -
↳independent cell death, and Cdk2 is required for both pathways."
},
{
  "pubmed": 20465575,
  "text": "In addition to having a pivotal role in the up-regulation of IL-2 and
↳IL-2RA gene expression, IKK controls the expression of cyclin D3, cyclin E and CDK2,
↳and the stability SKP2 and its co-factor CKS1B, through mechanisms independent of
↳IL-2."
},
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  "text": "Observational study of gene-disease association. (HuGE Navigator)"
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  "pubmed": 20512928,
  "text": "Hr and VDR interact via multiple protein-protein interfaces,
↳catalyzing histone demethylation to effect chromatin remodeling and repress the
↳transcription of VDR target genes that control the hair cycle."
},
{
  "pubmed": 20694007,
  "text": "protein phosphatase 1 competition with Cdk-cyclins for retinoblastoma
↳protein(Rb) binding is sufficient to retain Rb activity and block cell-cycle
↳advancement."
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{
  "pubmed": 20711190,
  "text": "cyclin-dependent kinases (Cdks), especially Cdk1 and Cdk2, promote
↳interphase nuclear pore complex formation in human dividing cells."
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    "text": "Nuclear export of HPV31 E1 is inhibited by Cdk2 phosphorylation at two_
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    "pubmed": 20935635,
    "text": "The results demonstrate that CDK2-mediated phosphorylation is a key_
↪mechanism governing EZH2 function and that there is a link between the cell-cycle_
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    "pubmed": 21062975,
    "text": "Data show that miR-302 simultaneously suppressed both the cyclin E-
↪CDK2 and cyclin D-CDK4/6 pathways to block>70% of the G1-S cell cycle transition."
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    "pubmed": 21099355,
    "text": "Overexpression of human Cdk2 resulted in a defect in the G1 to S_
↪transition and a reduction in viability."
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    "pubmed": 21233845,
    "text": "MicroRNA miR-885-5p targets CDK2 and MCM5, activates p53 and inhibits_
↪proliferation and survival."
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    "pubmed": 21262353,
    "text": "Cdk2 functions via a Cdk2/SHP-1/beta-catenin/CEACAM1 axis, and show_
↪that Cdk2 has the capacity to regulate insulin internalization."
  },
  {
    "pubmed": 21264535,
    "text": "XPD may play an important role in cell apoptosis of hepatoma by_
↪inducing an over-expression of p53, but suppressing expressions of c-myc and cdk2"
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    "text": "CDK2 downregulation causes high apoptosis at the early time points"
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    "pubmed": 21325496,
    "text": "Conclude that in cisplatin induced-kidney injury phosphorylation of_
↪p21 by Cdk2 limits the effectiveness of p21 to inhibit Cdk2."
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    "pubmed": 21454540,
    "text": "the ability of Emil to inhibit APC/C is negatively regulated by CDKs"
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    "pubmed": 21515670,
    "text": "cyclin E and CDK2 genes are key physiological effectors of the c-ETS1_
↪proto-oncogene. Furthermore, c-ETS1 is indispensable for the hepatotropic action of_
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      "text": "The deubiquitinase USP37 binds CDH1 and removes degradative
↪polyubiquitin from cyclin A. USP37 was induced by E2F factors in G1, peaked at G1/S,
↪and was degraded in late mitosis. Phosphorylation of USP37 by CDK2 stimulated its
↪full activity."
    },
    {
      "pubmed": 21646351,
      "text": "anti-oncogenic role of miR-372 may be through control of cell growth
↪and cell cycle progression by down-regulating the cell cycle genes CDK2 and cyclin
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    {
      "pubmed": 21658603,
      "text": "Cdk2 is required for cell proliferation."
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    {
      "pubmed": 21769424,
      "text": "RT-PCR and Western blotting results revealed that both mRNA and
↪protein levels of CDK2 were significantly higher in tumor tissues."
    },
    {
      "pubmed": 21871181,
      "text": "NF-Y binds to CCAAT sequences in the Cyclin A promoter, as well as to
↪those in the promoters of cell cycle G2 regulators such as CDC2, Cyclin B and
↪CDC25C."
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    {
      "pubmed": 21918011,
      "text": "Epstein-Barr virus Rta-mediated transactivation of p21 and 14-3-3sigma
↪arrests cells at the G1/S transition by reducing cyclin E/CDK2 activity."
    },
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      "pubmed": 21941773,
      "text": "The expression level of CDK2 protein did not change significantly in
↪silica-induced human embryo lung fibroblasts."
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      "pubmed": 21965652,
      "text": "excess of MCM3 up-regulates the phosphorylation of CHK1 Ser-345 and
↪CDK2 Thr-14."
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      "pubmed": 22084169,
      "text": "The S-phase-specific cyclin-dependent kinase 2 was required for robust
↪activation of ATR in response to diverse chemotherapeutic agents."
    },
    {
      "pubmed": 22231403,
      "text": "The authors show that, in human and mouse, Mre11 controls these events
↪through a direct interaction with CDK2 that is required for CtIP phosphorylation
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↪division cycle 25 homolog A (CDC25A) expression in cancer."
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      "pubmed": 22474407,
      "text": "CDK2 inhibition drastically diminishes anchorage-independent growth of
↪human cancer cells and cells transformed with various oncogenes"
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      "pubmed": 22479189,
      "text": "low molecular weight cyclin E (LMW-E) requires CDK2-associated kinase
↪activity to induce mammary tumor formation by disrupting acinar development"
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      "pubmed": 22673765,
      "text": "The activation of p21(Waf1/Cip1) was significantly up-regulated over
↪time, but there was no change in the level of CDK2 expression by treatment of
↪HEK293 cells with various concentrations of veterinary antibiotics."
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      "pubmed": 22718829,
      "text": "Human cytomegalovirus IE1/2 expression was downregulated by cyclin A2,
↪CDK1 and CDK2."
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      "pubmed": 22819841,
      "text": "exposure of cancer cells (such as HeLa and MCF7 cells) to H2O2
↪increased CDK2 activity with no accompanying change in the PCNA level, leading to
↪cell proliferation."
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      "pubmed": 22927831,
      "text": "By a chemical-genetic approach study identified Nbs1 as a target of
↪Cdk2, and mapped the phosphorylation to a conserved CDK consensus recognition site."
    },
    {
      "pubmed": 22951823,
      "text": "cellular CDK2 phosphorylates the functionally critical S/T-P sites of
↪the hepadnavirus core CTD and is incorporated into viral capsids"
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      "pubmed": 23028682,
      "text": "cyclin A-Cdk2 regulates apoptosis through a mechanism that involves
↪Rad9phosphorylation"
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      "pubmed": 23065011,
      "text": "human papillomavirus E4 proteins can interact with cyclin A and cdk2,
↪which may contribute to viral manipulation of the host cell cycle."
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      "text": "EEF2 phosphorylation by cyclin A-cyclin-dependent kinase 2 (CDK2) on a_
↪novel site, serine 595 (S595), directly regulates T56 phosphorylation by eEF2K."
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    {
      "pubmed": 23185313,
      "text": "This study aimed to explore the effects of single nucleotide_
↪polymorphisms in CDK2 and CCNE1 on breast cancer risk, progression and survival in_
↪a Chinese Han population."
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      "text": "Findings revealed a novel function of simultaneous p27 and CDK2_
↪cytoplasmic mislocalization in mediating growth-factor-regulated cell proliferation,
↪migration and invasion."
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      "pubmed": 23300027,
      "text": "possible relationship between the CDK2 deleterious variants and the_
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      "text": "Constitutive Cdk2 activity promotes aneuploidy while altering the_
↪spindle assembly and tetraploidy checkpoints."
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      "text": "Constitutive CCND1/CDK2 expression contributes to neoplastic mammary_
↪epithelial cell transformation."
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      "text": "The prolyl isomerase Pin1 acts synergistically with CDK2 to regulate_
↪the basal activity of estrogen receptor alpha in breast cancer."
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      "text": "Aurora-A kinase-induced centrosome amplification was mediated by Cdk2_
↪kinase."
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↪miR-372 and miR-373, which target CDK2."
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↪the successful execution of the replication stress checkpoint response and in
↪maintaining genome integrity.",
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      "pubmed": 23720738,
      "text": "MCM7 is a substrate of cyclin E/Cdk2 and can be phosphorylated on Ser-
↪121.",
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      "pubmed": 23727278,
      "text": "Data indicate that different binding sites of cyclin-dependent kinase
↪(CDK2) contributing towards the binding of inhibitors.",
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      "text": "CDK7 involved in phosphorylation/activation of CDK4 and CDK6;
↪existence of CDK4-activating kinase(s) other than CDK7; and novel CDK7-dependent
↪positive feedbacks mediated by p21 phosphorylation by CDK4 and CDK2 to sustain CDK4
↪activation.",
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      "pubmed": 23776131,
      "text": "FBXO28 activity and stability are regulated during the cell cycle by
↪CDK1/2-mediated phosphorylation of FBXO28, which is required for its efficient
↪ubiquitylation of MYC.",
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    {
      "pubmed": 23781148,
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↪G1 phase progression and G1/S transition through inhibiting CDK2 expression and
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      "text": "This study indicates that genetic polymorphisms of AURKA, BRCA1 and
↪CCNE1 may affect ovarian cancer susceptibility in Chinese Han women.",
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      "pubmed": 24075009,
      "text": "Cells decide at the end of mitosis to either start the next cell cycle
↪by immediately building up CDK2 activity or to enter a transient G0-like state by
↪suppressing CDK2 activity.",
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    "text": "CDK2 knockdown alters the profile of Rb phosphorylation in coronary_
↪artery smooth muscle cells, as well as the proliferative response of these cells to_
↪mitogenic stimulation."
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    "pubmed": 24386425,
    "text": "Of the total, the deregulation of several genes (CDK1, CDK2, CDK4,_
↪MCM2, MCM3, MCM4, EIF3a and RPN2) were potentially associated with disease_
↪development and progression."
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    "pubmed": 24444383,
    "text": "MYC-dependent breast cancer cells possess high MYC expression and high_
↪level of MYC phosphorylation, but are not sensitive to inhibition of CDK2."
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    "text": "CRIF1 may play a regulatory role in the BM microenvironment-induced_
↪leukemia cell cycle arrest possibly through interacting with CDK2 and acting as a_
↪cyclin-dependent kinase inhibitor."
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    "pubmed": 24623419,
    "text": "Authors identified and validated two additional host proteins_
↪interacting with human SAMHD1, namely, cyclin-dependent kinase 2 (CDK2) and S-phase_
↪kinase-associated protein 2 (SKP2)."
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    "pubmed": 24671051,
    "text": "Expression of Notch1, -2, and -3, CDK2, and CCNE1 was significantly_
↪decreased by upregulation of ALDH1A1 in A549 cells, but increased by its_
↪interruption in A549s cells."
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    "pubmed": 24700371,
    "text": "In the subsequent molecular experiments, western blot analysis and_
↪kinase activity detection demonstrated that TAMs can significantly boost the_
↪expression levels and activities of CDK2 and CDK4 in SKOV3 cells."
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    "pubmed": 24820417,
    "text": "Results show that CDK2 phosphorylates Thr-156 in GATA3."
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    "pubmed": 24911186,
    "text": "Report structure-based discovery of allosteric inhibitors of CDK2."
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    "text": "CDK2 Supports HIV-1 Reverse Transcription in CD4+ T Cells.HIV-1_
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      "pubmed": 24935000,
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↪increased cdk2/cyclin A, driving RCC cells into the G2/M-phase. VPA hinders
↪everolimus non-response by diminishing cdk2/cyclin A."
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      "pubmed": 24947816,
      "text": "More effective packing and interactions between CDK2 and LMW cyclin E
↪isoforms, however, produce more efficient protein-protein complexes that accelerate
↪the cell division processes in cancer cells, where these cyclin E isoforms are
↪overexpressed."
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      "text": "CDK2 was strongly linked to cell cycle progression and coordinated
↪SAMHD1 phosphorylation and inactivation."
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      "pubmed": 25071185,
      "text": "Cdk1 activity blocks lysosomal degradation of HIF-1alpha and increases
↪HIF-1alpha protein stability and transcriptional activity. By contrast, Cdk2
↪activity promotes lysosomal degradation of HIF-1alpha at the G1/S phase transition."
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      "pubmed": 25136960,
      "text": "A positive correlation between cdk2/cyclin A expression level and
↪tumor growth. Amygdalin, therefore, may block tumor growth."
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      "pubmed": 25149358,
      "text": "for both oncogene- and DNA damage-induced cellular senescence, CDK2
↪transcript and protein are decreased in a p53- and RB-dependent manner, and this
↪repression is necessary for cell-cycle exit during senescence"
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    {
      "pubmed": 25154617,
      "text": "Which is mutated at the CDK2 phosphorylation site."
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      "pubmed": 25218592,
      "text": "The Cell Cycle Profiling - Risk Score (C2P-RS) based on CDK1 and CDK2
↪specific activities was significantly associated with relapse in breast cancers."
    },
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      "pubmed": 25218637,
      "text": "Data indicate that tumour suppressor RASSF1A triggers large tumor
↪suppressor kinase 1 (LATS)-CDK2 interaction and restricts CDK2 kinase activity
↪towards BRCA2."
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      "text": "Cyclin A2 and its associated kinase (CDK2) activity are required for
↪optimal induction of progesterone receptor target genes in breast cancer cells."
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    "pubmed": 25265349,
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    "text": "observations suggested that androgen suppresses the proliferation of
↪CRPC cells partially through inhibition of Cyclin A, Cdk2, and Skp2"
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    "pubmed": 25303791,
    "text": "TPPII, MYBBP1A and CDK2 form a protein-protein interaction network."
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    "pubmed": 25410660,
    "text": "Inhibition of CDK2 phosphorylation blocked phosphorylation of hnRNP K,
↪preventing its incorporation into stress granules (SGs). Due to interaction between
↪hnRNP K with TDP-43, the loss of hnRNP K from SGs prevented accumulation of TDP-43."
  },
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    "pubmed": 25443276,
    "text": "At a median follow-up of 36 months (1-109M), tumor with low CDK2SA-
↪CDK1SA ratio showed significantly better 5-year recurrence-free survival than those
↪with high CDK2SA-CDK1SA ratio (88.7% vs. 54.7%, P = 0.00141)."
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  {
    "pubmed": 25451924,
    "text": "miR-638 regulates proliferation and myeloid differentiation by
↪targeting CDK2 and may serve as a novel target for leukemia therapy or marker for
↪AML diagnosis and prognosis"
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    "text": "No association of CDK2 polymorphisms with risk of endometrial
↪carcinoma found in Chinese Han women."
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    "text": "HOXA7 promotes cell proliferation, and these changes are mediated by
↪cyclin E1/CDK2"
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    "pubmed": 25541464,
    "text": "Using the fact that deletion of the yeast CDC28 gene is functionally
↪complemented by human CDK1 or CDK2, we set up an in vivo screen system to evaluate
↪the inhibitory potency of purine derivatives against these two human Cdk."
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    "pubmed": 25728284,
    "text": "CDK2 up-regulates the protein level of KLF10 through reducing its
↪association with SIAH1, a KLF10 E3-ubiquitin ligase involved in proteasomal
↪degradation."
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    "pubmed": 25744732,
    "text": "Diclofenac and curcumin overcome these carcinogenic effects by
↪downregulating telomerase activity, diminishing the expression of TERT, CDK4, CDK2,
↪cyclin D1, and cyclin E."

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      "text": "The docking and molecular dynamics investigation performed here led to
↪the identification of the interactions responsible for stabilizing the ligand
↪ChEMBL474807 at the active sites of the glycogen synthase kinase-3beta (GSK-3) and
↪cyclin-dependent kinase-2"
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    {
      "pubmed": 25808870,
      "text": "CP110 plays a mechanistic role in response of lung cancer cells to
↪CDK2 inhibition, especially in the presence of activated KRAS mutations."
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      "text": "NUAK2 silencing and inactivation of the PI3K pathway efficiently
↪controlled CDK2 expression, whereas CDK2 inactivation specifically abrogated the
↪growth of NUA2-amplified and PTEN-deficient melanoma cells."
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      "pubmed": 25860957,
      "text": "Identified ING5 as a novel CDK2 substrate. ING5 is phosphorylated at a
↪single site, threonine 152, by cyclin E/CDK2 and cyclin A/CDK2. This site is also
↪phosphorylated in cells in a cell cycle dependent manner, consistent with it being
↪a CDK2 substrate."
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↪mechanisms of CDK2 [review]"
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"wikipathways": [
  {
    "id": "WP1530",
    "name": "miRNA Regulation of DNA Damage Response"
  },
  {
    "id": "WP179",
    "name": "Cell Cycle"
  },
  {
    "id": "WP2032",
    "name": "TSH signaling pathway"
  },
  {
    "id": "WP2261",
    "name": "Signaling Pathways in Glioblastoma"
  },
  {
    "id": "WP2374",
    "name": "Oncostatin M Signaling Pathway"
  },
  {
    "id": "WP2377",
    "name": "Integrated Pancreatic Cancer Pathway"
  },
  {
    "id": "WP2431",
    "name": "Spinal Cord Injury"
  },
  {
    "id": "WP2446",
    "name": "Retinoblastoma (RB) in Cancer"
  },
  {
    "id": "WP2586",
    "name": "Aryl Hydrocarbon Receptor"
  },
  {
    "id": "WP2877",
    "name": "Vitamin D Receptor Pathway"
  },
  {
    "id": "WP45",
    "name": "G1 to S cell cycle control"
  },
  {
    "id": "WP466",
    "name": "DNA Replication"
  }
],
```

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```
{
  "id": "WP53",
  "name": "ID signaling pathway"
},
{
  "id": "WP707",
  "name": "DNA Damage Response"
}
]
},
"pdb": [
  "1AQ1",
  "1B38",
  "1B39",
  "1BUH",
  "1CKP",
  "1DI8",
  "1DM2",
  "1E1V",
  "1E1X",
  "1E9H",
  "1F5Q",
  "1FIN",
  "1FQ1",
  "1FVT",
  "1FVV",
  "1G5S",
  "1GIH",
  "1GII",
  "1GIJ",
  "1GY3",
  "1GZ8",
  "1H00",
  "1H01",
  "1H07",
  "1H08",
  "1H0V",
  "1H0W",
  "1H1P",
  "1H1Q",
  "1H1R",
  "1H1S",
  "1H24",
  "1H25",
  "1H26",
  "1H27",
  "1H28",
  "1HCK",
  "1HCL",
  "1JST",
  "1JSU",
  "1JSV",
  "1JVP",
  "1KE5",
  "1KE6",
  "1KE7",
  "1KE8",
```

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```
"1KE9",  
"1OGU",  
"1OI9",  
"1OIQ",  
"1OIR",  
"1OIT",  
"1OIU",  
"1Oiy",  
"1OKV",  
"1OKW",  
"1OL1",  
"1OL2",  
"1P2A",  
"1P5E",  
"1PF8",  
"1PKD",  
"1PW2",  
"1PXI",  
"1PXJ",  
"1P XK",  
"1PXL",  
"1PXM",  
"1P XN",  
"1P XO",  
"1PXP",  
"1PYE",  
"1QMZ",  
"1R78",  
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"1URW",  
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"1VYW",  
"1VYZ",  
"1W0X",  
"1W8C",  
"1W98",  
"1WCC",  
"1Y8Y",  
"1Y91",  
"1YKR",  
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"2A4L",  
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"2B54",  
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"2BPM",  
"2BTR",  
"2BTS",  
"2C4G",  
"2C5N",  
"2C5O",  
"2C5V",  
"2C5X",
```

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```
"2C5Y",  
"2C68",  
"2C69",  
"2C6I",  
"2C6K",  
"2C6L",  
"2C6M",  
"2C6O",  
"2C6T",  
"2CCH",  
"2CCI",  
"2CJM",  
"2CLX",  
"2DS1",  
"2DUV",  
"2EXM",  
"2FVD",  
"2G9X",  
"2HIC",  
"2I40",  
"2IW6",  
"2IW8",  
"2IW9",  
"2J9M",  
"2JGZ",  
"2R3F",  
"2R3G",  
"2R3H",  
"2R3I",  
"2R3J",  
"2R3K",  
"2R3L",  
"2R3M",  
"2R3N",  
"2R3O",  
"2R3P",  
"2R3Q",  
"2R3R",  
"2R64",  
"2UUE",  
"2UZB",  
"2UZD",  
"2UZE",  
"2UZL",  
"2UZN",  
"2UZO",  
"2V0D",  
"2V22",  
"2VTA",  
"2VTH",  
"2VTI",  
"2VTJ",  
"2VTL",  
"2VTM",  
"2VTN",  
"2VTO",  
"2VTP",
```

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```
"2VTQ",  
"2VTR",  
"2VTS",  
"2VTT",  
"2VU3",  
"2VV9",  
"2W05",  
"2W06",  
"2W17",  
"2W1H",  
"2WEV",  
"2WFY",  
"2WHB",  
"2WIH",  
"2WIP",  
"2WMA",  
"2WMB",  
"2WPA",  
"2WXV",  
"2X1N",  
"2XMY",  
"2XNB",  
"3BHT",  
"3BHU",  
"3BHV",  
"3DDP",  
"3DDQ",  
"3DOG",  
"3EID",  
"3EJ1",  
"3EOC",  
"3EZR",  
"3EZV",  
"3F5X",  
"3FZ1",  
"3IG7",  
"3IGG",  
"3LE6",  
"3LFN",  
"3LFQ",  
"3LFS",  
"3MY5",  
"3NS9",  
"3PJ8",  
"3PXF",  
"3PXQ",  
"3PXR",  
"3PXY",  
"3PXZ",  
"3PY0",  
"3PY1",  
"3QHR",  
"3QHW",  
"3QL8",  
"3QQF",  
"3QQG",  
"3QQH",
```

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```
"3QQJ",  
"3QQK",  
"3QQL",  
"3QRT",  
"3QRU",  
"3QTQ",  
"3QTR",  
"3QTS",  
"3QTU",  
"3QTW",  
"3QTX",  
"3QTZ",  
"3QU0",  
"3QWJ",  
"3QWK",  
"3QX2",  
"3QX4",  
"3QXO",  
"3QXP",  
"3QZF",  
"3QZG",  
"3QZH",  
"3QZI",  
"3R1Q",  
"3R1S",  
"3R1Y",  
"3R28",  
"3R6X",  
"3R71",  
"3R73",  
"3R7E",  
"3R7I",  
"3R7U",  
"3R7V",  
"3R7Y",  
"3R83",  
"3R8L",  
"3R8M",  
"3R8P",  
"3R8U",  
"3R8V",  
"3R8Z",  
"3R9D",  
"3R9H",  
"3R9N",  
"3R9O",  
"3RAH",  
"3RAI",  
"3RAK",  
"3RAL",  
"3RJC",  
"3RK5",  
"3RK7",  
"3RK9",  
"3RKB",  
"3RM6",  
"3RM7",
```

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```
"3RMF",  
"3RNI",  
"3ROY",  
"3RPO",  
"3RPR",  
"3RPV",  
"3RPY",  
"3RZB",  
"3S00",  
"3S00",  
"3S1H",  
"3S2P",  
"3SQQ",  
"3SW4",  
"3SW7",  
"3TI1",  
"3TIY",  
"3TIZ",  
"3TNW",  
"3ULI",  
"3UNJ",  
"3UNK",  
"3WBL",  
"4ACM",  
"4BCK",  
"4BCM",  
"4BCN",  
"4BCO",  
"4BCP",  
"4BCQ",  
"4BGH",  
"4BZD",  
"4CFM",  
"4CFN",  
"4CFU",  
"4CFV",  
"4CFW",  
"4CFX",  
"4D1X",  
"4D1Z",  
"4EK3",  
"4EK4",  
"4EK5",  
"4EK6",  
"4EK8",  
"4EOI",  
"4EOJ",  
"4EOK",  
"4EOL",  
"4EOM",  
"4EON",  
"4EOO",  
"4EOP",  
"4EOQ",  
"4EOR",  
"4EOS",  
"4ERW",
```

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```

"4EZ3",
"4EZ7",
"4FKG",
"4FKI",
"4FKJ",
"4FKL",
"4FKO",
"4FKP",
"4FKQ",
"4FKR",
"4FKS",
"4FKT",
"4FKU",
"4FKV",
"4FKW",
"4FX3",
"4GCJ",
"4I3Z",
"4II5",
"4KD1",
"4LYN",
"4NJ3",
"4RJ3",
"5A14",
"5AND",
"5ANE",
"5ANG",
"5ANI",
"5ANJ",
"5ANK",
"5ANO",
"5CYI",
"5D1J",
"5FP5",
"5FP6",
"5IEV",
"5IEX",
"5IEY",
"5IF1"
],
"pfam": "PF00069",
"pharmgkb": "PA101",
"pir": "A41227",
"prosite": "PS50011",
"reagent": {
  "GNF_Qia_hs-genome_v1_siRNA": [
    {
      "id": "GNF247215",
      "relationship": "is"
    },
    {
      "id": "GNF247216",
      "relationship": "is"
    },
    {
      "id": "GNF247217",
      "relationship": "is"
    }
  ]
}

```

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```
    },
    {
      "id": "GNF247218",
      "relationship": "is"
    }
  ],
  "GNF_hs-ORFeome1_1_reads": {
    "id": "GNF161504",
    "relationship": "is"
  },
  "GNF_hs-Origene": [
    {
      "id": "GNF035860",
      "relationship": "similar to"
    },
    {
      "id": "GNF037258",
      "relationship": "is"
    },
    {
      "id": "GNF048982",
      "relationship": "is"
    }
  ],
  "GNF_hs-druggable_lenti-shRNA": [
    {
      "id": "GNF081385",
      "relationship": "is"
    },
    {
      "id": "GNF081386",
      "relationship": "is"
    },
    {
      "id": "GNF081387",
      "relationship": "is"
    }
  ],
  "GNF_hs-druggable_plasmid-shRNA": [
    {
      "id": "GNF051995",
      "relationship": "is"
    },
    {
      "id": "GNF056761",
      "relationship": "is"
    },
    {
      "id": "GNF061563",
      "relationship": "is"
    },
    {
      "id": "GNF078683",
      "relationship": "is"
    }
  ],
  "GNF_hs-druggable_siRNA": [
```

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```

    {
      "id": "GNF066537",
      "relationship": "is"
    },
    {
      "id": "GNF066538",
      "relationship": "is"
    }
  ],
  "GNF_hs-pkinase_IDT-siRNA": [
    {
      "id": "GNF166768",
      "relationship": "is"
    },
    {
      "id": "GNF166769",
      "relationship": "is"
    },
    {
      "id": "GNF166770",
      "relationship": "is"
    },
    {
      "id": "GNF166771",
      "relationship": "is"
    }
  ],
  "GNF_hs_LentiORF-HA-MYC": {
    "id": "GNF282834",
    "relationship": "is"
  },
  "GNF_hs_LentiORF-Jred": {
    "id": "GNF283761",
    "relationship": "is"
  },
  "GNF_mm+hs-MGC": {
    "id": "GNF002384",
    "relationship": "is"
  },
  "Invitrogen_IVTHSSIPkv2": [
    {
      "id": "GNF324610",
      "relationship": "is"
    },
    {
      "id": "GNF324611",
      "relationship": "is"
    }
  ],
  "NIBRI_hs-Secretome_pDEST": {
    "id": "GNF337962",
    "relationship": "is"
  },
  "NOVART_hs-genome_siRNA": [
    {
      "id": "GNF093028",
      "relationship": "is"
    }
  ]

```

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```

    },
    {
      "id": "GNF132726",
      "relationship": "is"
    }
  ]
},
"refseq": {
  "genomic": [
    "NC_000012.12",
    "NC_018923.2",
    "NG_034014.1"
  ],
  "protein": [
    "NP_001277159.1",
    "NP_001789.2",
    "NP_439892.2",
    "XP_011536034.1"
  ],
  "rna": [
    "NM_001290230.1",
    "NM_001798.4",
    "NM_052827.3",
    "XM_011537732.1"
  ],
  "translation": [
    {
      "protein": "XP_011536034.1",
      "rna": "XM_011537732.1"
    },
    {
      "protein": "NP_001789.2",
      "rna": "NM_001798.4"
    },
    {
      "protein": "NP_439892.2",
      "rna": "NM_052827.3"
    },
    {
      "protein": "NP_001277159.1",
      "rna": "NM_001290230.1"
    }
  ]
},
"reporter": {
  "HG-U133_Plus_2": [
    "204252_at",
    "211803_at",
    "211804_s_at"
  ],
  "HG-U95Av2": [
    "1792_g_at",
    "1833_at"
  ],
  "HTA-2_0": "TC12000496.hg.1",
  "HuEx-1_0": "3417146",
  "HuGene-1_1": "7956076",

```

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```

    "HuGene-2_1": "16752305"
  },
  "summary": "This gene encodes a member of a family of serine/threonine protein_
↳kinases that participate in cell cycle regulation. The encoded protein is the_
↳catalytic subunit of the cyclin-dependent protein kinase complex, which regulates_
↳progression through the cell cycle. Activity of this protein is especially critical_
↳during the G1 to S phase transition. This protein associates with and regulated by_
↳other subunits of the complex including cyclin A or E, CDK inhibitor p21Cip1_
↳(CDKN1A), and p27Kip1 (CDKN1B). Alternative splicing results in multiple transcript_
↳variants.",
  "symbol": "CDK2",
  "taxid": 9606,
  "type_of_gene": "protein-coding",
  "unigene": [
    "Hs.19192",
    "Hs.689624"
  ],
  "uniprot": {
    "Swiss-Prot": "P24941",
    "TrEMBL": [
      "A0A024RB10",
      "A0A024RB77",
      "B4DDL9",
      "E7ESI2",
      "G3V317",
      "G3V5T9"
    ]
  },
  "wikipedia": {
    "url_stub": "Cyclin-dependent kinase 2"
  }
}

```

### 4.5.3 Batch queries via POST

Although making simple GET requests above to our gene query service is sufficient in most of use cases, there are some cases you might find it's more efficient to make queries in a batch (e.g., retrieving gene annotation for multiple genes). Fortunately, you can also make batch queries via POST requests when you need:

```

URL: http://mygene.info/v3/gene
HTTP method: POST

```

#### Query parameters

##### ids

Required. Accept multiple geneids (either Entrez or Ensembl gene ids) seperated by comma, e.g., 'ids=1017,1018' or 'ids=695,ENSG00000123374'. Note that currently we only take the input ids up to **1000** maximum, the rest will be omitted.

## fields

Optional, can be a comma-separated fields to limit the fields returned from the matching hits. If “fields=all”, all available fields will be returned. Note that it supports dot notation as well, e.g., you can pass “refseq.rna”. Default: “symbol,name,taxid,entrezgene”.

## species

Optional, can be used to limit the gene hits from given species. You can use “common names” for nine common species (human, mouse, rat, fruitfly, nematode, zebrafish, thale-cress, frog and pig). All other species, you can provide their taxonomy ids. See [more details here](#). Multiple species can be passed using comma as a separator. Passing “all” will query against all available species. Default: all.

## dotfield

Optional, can be used to control the format of the returned fields when passed “fields” parameter contains dot notation, e.g. “fields=refseq.rna”. If “dotfield” is true, the returned data object contains a single “refseq.rna” field, otherwise, a single “refseq” field with a sub-field of “rna”. Default: false.

## email

Optional, if you are regular users of our services, we encourage you to provide us an email, so that we can better track the usage or follow up with you.

## Example code

Unlike GET requests, you can easily test them from browser, make a POST request is often done via a piece of code, still trivial of course. Here is a sample python snippet:

```
import requests
headers = {'content-type': 'application/x-www-form-urlencoded'}
params = 'ids=1017,695&fields=name,symbol,refseq.rna'
res = requests.post('http://mygene.info/v3/gene', data=params, headers=headers)
```

## Returned object

Returned result (the value of “res.text” variable above) from above example code should look like this:

```
[
  {
    '_id': '1017',
    '_score': 21.731894,
    'name': 'cyclin dependent kinase 2',
    'query': '1017',
    'refseq': {
      'rna': [
        'NM_001290230.1',
        'NM_001798.4',
        'NM_052827.3',
        'XM_011537732.1'
      ]
    }
  }
]
```

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```

    ]
  },
  'symbol': 'CDK2'
},
{
  '_id': '695',
  '_score': 21.730501,
  'name': 'Bruton tyrosine kinase',
  'query': '695',
  'refseq': {
    'rna': [
      'NM_000061.2',
      'NM_001287344.1',
      'NM_001287345.1'
    ]
  }
},
'symbol': 'BTK'
}
]

```

## 4.6 Server response

The MyGene.info server returns a variety of query responses, and response status codes. They are listed here.

**Note:** These examples show query responses using the python `requests` package.

### 4.6.1 Status code 200

A **200** status code indicates a successful query, and is accompanied by the query response payload.

```

In [1]: import requests

In [2]: r = requests.get('http://mygene.info/v3/query?q=_exists_:entrezgene')

In [3]: r.status_code
Out[3]: 200

In [4]: data = r.json()

In [5]: data.keys()
Out[5]: dict_keys(['total', 'max_score', 'took', 'hits'])

```

### 4.6.2 Status code 400

A **400** status code indicates an improperly formed query, and is accompanied by a response payload describing the source of the error.

```

In [6]: r = requests.get('http://mygene.info/v3/query?q=_exists_:entrezgene&size=u')

```

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```
In [7]: r.status_code
Out[7]: 400

In [8]: data = r.json()

In [9]: data
Out[9]:
{'error': "Expected 'size' parameter to have integer type.  Couldn't convert 'u' to_
↪integer",
 'success': False}
```

### 4.6.3 Status code 404

A **404** status code indicates either an unrecognized URL, as in (*/query* is misspelled */quer* resulting in an unrecognized URL):

```
In [10]: r = requests.get('http://mygene.info/v3/quer?q=_exists_:entrezgene')

In [11]: r.status_code
Out[11]: 404
```

or, for the */gene* endpoint, a **404** status code could be from querying for a nonexistent gene ID, as in:

```
In [12]: r = requests.get('http://mygene.info/v3/gene/0')

In [13]: r.status_code
Out[13]: 404

In [14]: data = r.json()

In [15]: data
Out[15]:
{'error': "Gene ID '0' not found",
 'success': False}
```

### 4.6.4 Status code 5xx

Any **5xx** status codes are the result of uncaught query errors. Ideally, these should never occur. We routinely check our logs for these types of errors and add code to catch them, but if you see any status **5xx** responses, please submit a bug report to [help@mygene.info](mailto:help@mygene.info).

## 4.7 Usage and Demo

This page provides some usage examples and demo applications.

### 4.7.1 Call from web applications

You can call MyGene.info services from either server-side or client-side (via AJAX). The sample code can be found at “*demo*” section.

## Calling services from server-side

All common programming languages provide functions for making http requests and JSON parsing. For Python, you can use built-in `httplib` and `json` modules (v2.6 up), or third-party `httplib2` and `simplejson` modules. For Perl, `LWP::Simple` and `JSON` modules should work nicely.

## Making AJAX calls from client-side

When making an AJAX call from a web application, it is restricted by “same-origin” security policy, but there are several standard ways to get it around.

## Making your own server-side proxy

To overcome “same-origin” restriction, you can create proxy at your server-side to our services. And then call your proxied services from your web application.

Setup proxy in popular server-side applications, like `Apache`, `Nginx` and `PHP`, are straightforward.

## Making JSONP call

Because our core services are just called as simple GET http requests (though we support POST requests for batch queries too), you can bypass “same-origin” restriction by making JSONP call as well. To read more about JSONP, see [1](#), [2](#), or just Google about it. All our services accept an optional “callback” parameter, so that you can pass your callback function to make a JSONP call.

All popular javascript libraries have the support for making JSONP calls, like in `JQuery`, `ExtJS`, `MooTools`

## Cross-origin http request through CORS

Cross-Origin Resource Sharing (CORS) specification is a [W3C draft specification](#) defining client-side cross-origin requests. It’s actually supported by all major browsers by now (Internet Explorer 8+, Firefox 3.5+, Safari 4+, and Chrome. See more on [browser support](#)), but not many people are aware of it. Unlike JSONP, which is limited to GET requests only, you can make cross-domain POST requests as well. Our services supports CORS requests on both GET and POST requests. You can find more information and use case [here](#) and [here](#).

JQuery’s native ajax call supports CORS since v1.5.

## 4.7.2 Demo Applications

In this demo, we want to create a web site to display expression charts from a microarray dataset (Affymetrix MOE430v2 chip). The expression data are indexed by porobeset ids, but we need to allow users to query for any mouse genes using any commonly-used identifiers, and then display expression charts for any selected gene.

We implemented this demo in four ways:

### Example 1: using CGI

- [Download sample code here.](#)

- It's a simple python CGI script. To run it, you just need to drop it to your favorite web server's cgi-bin folder (make sure your python, v2.6 up, is in the path).
- [See it in action here.](#)

### Example 2: using tornado

- [Download sample code here.](#)
- This single python script can be used to run a standalone website. Just run: `python mygene_info_demo_tornado.py`. You then have your website up at `http://localhost:8000`.

Besides python (v2.6 up), you also need `tornado` to run this code. You can either install it by your own (`pip install tornado`), or download [this zip file](#), which includes tornado in it.

- [See it in action here.](#)

### Example 3: using JSONP

- [Download sample code here.](#)
- The zip file contains one html file and one javascript file. There is no server-side code at all. To run it, just unzip it and open the html file in any browser. All remote service calls are done at client side (via browsers). Put the files into any web server serving static files will allow you to publish to the world.
- [See it in action here.](#)

### Example 4: using CORS

- [Download sample code here.](#)
- The zip file contains one html file and one javascript file. There is no server-side code at all. To run it, just unzip it and open the html file in any browser. All remote service calls are done at client side (via browsers). Put the files into any web server serving static files will allow you to publish to the world.
- This demo is almost the same as the one using JSONP, except that the actual AJAX call to MyGene.info server is made via CORS.
- [See it in action here.](#)

## 4.7.3 Autocomplete widget for gene query

When you build a web application to have users to query for their favorite genes, the autocomplete widget is very useful, as it provides suggestions while users start to type into the field.

---

**Note:** The autocomplete widget below is a simple demo application. You may also want to have a look at [this more sophisticated autocomplete widget](#), which comes with a lot more customization options.

---

## Try it live first

### About this widget

This autocomplete widget for gene query provides suggestions while you type a gene symbol or name into the field. Here the gene suggestions are displayed as “<Symbol>:<Name>”, automatically triggered when at least two characters are entered into the field.

At the backend, this widget is powered by [the gene query web service](#) from MyGene.info. By default, the gene suggestions display human genes only.

### Use it in your website

To use this widget in your own website is very easy, just following these three steps:

1. Copy/paste this line into your html file:

```
<script src="//docs.mygene.info/en/latest/_static/widget/autocomplete/js/mygene_
query_min.js" type="text/javascript"></script>
```

**Hint:** if you prefer an un-minified javascript file, using “mygene\_query.js” instead.

2. Add “mygene\_query\_target” class to your target input element:

```
<input id="gene_query" style="width:250px" class="mygene_query_target">
```

so that we know which input field to enable autocomplete.

3. Define your own callback function, which is triggered after user selects a gene. For example:

```
<script type="text/javascript">
  mygene_query_select_callback = function(event, ui){
    alert( ui.item ?
      "Selected: " + ui.item.label + '('+ui.item.entrezgene+')':
      "Nothing selected, input was " + this.value);
  };
</script>
```

As shown in above example, you can access the gene object as **ui.item**:

```
ui.item._id      gene id
ui.item.value    gene symbol
ui.item.label    the label displayed in autocomplete dropdown list
```

**Note:** if you don’t define your own callback function (like the minimal HTML page below), the default behavior is to display an alert msg with the gene selected. To change this default behavior, you must overwrite with your own callback function (keep the same name as “mygene\_query\_select\_callback”).

A minimal HTML page with autocomplete enabled looks just like this ([See it in action here](#)):

```
<html>
<body>
  <label for="gene_query">Enter a gene here: </label>
```

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```
<input style="width:250px" class="mygene_query_target">
<script src="//docs.mygene.info/en/latest/_static/widget/autocomplete/js/mygene_
↪query_min.js" type="text/javascript"></script>
</body>
</html>
```

Have fun! And send us feedback at [help@mygene.info](mailto:help@mygene.info).

## 4.8 Third-party packages

This page lists third-party packages/modules built upon MyGene.info services.

### 4.8.1 MyGene python module

“mygene” is an easy-to-use Python wrapper to access MyGene.info services.

You can install it easily using either `pip` or `easy_install`:

```
pip install mygene #this is preferred
```

or:

```
easy_install mygene
```

This is a brief example:

```
In [1]: import mygene

In [2]: mg = mygene.MyGeneInfo()

In [3]: mg.getgene(1017)
Out[3]:
{'_id': '1017',
 'entrezgene': 1017,
 'name': 'cyclin-dependent kinase 2',
 'symbol': 'CDK2',
 'taxid': 9606}

In [4]: mg.query('cdk2', size=2)
Out[4]:
{'hits': [{'_id': '1017',
            '_score': 373.24667,
            'entrezgene': 1017,
            'name': 'cyclin-dependent kinase 2',
            'symbol': 'CDK2',
            'taxid': 9606},
          {'_id': '12566',
            '_score': 353.90176,
            'entrezgene': 12566,
            'name': 'cyclin-dependent kinase 2',
            'symbol': 'Cdk2',
            'taxid': 10090}],
 'max_score': 373.24667,
```

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```
'took': 10,
'total': 28}
```

See <https://pypi.python.org/pypi/mygene> for more details.

## 4.8.2 MyGene R package

An R wrapper for the MyGene.info API is available in Bioconductor since v3.0. To install:

```
source("https://bioconductor.org/biocLite.R")
biocLite("mygene")
```

To view documentation for your installation, enter R and type:

```
browseVignettes("mygene")
```

For more information, visit the [Bioconductor mygene page](#).

## 4.8.3 MyGene autocomplete widget

This autocomplete widget for gene query (built upon [jQueryUI's autocomplete widget](#)) provides suggestions while you type a gene symbol or name into the field. You can easily embed it into your web application. It also provides many customization options for your different use-cases.

See <https://bitbucket.org/sulab/mygene.autocomplete/overview> for more details.

You can also play with this [jsFiddle example](#):

## 4.8.4 Another MyGene Python wrapper

This is yet another Python wrapper of MyGene.info services created by [Brian Schrader](#). It's hosted at <https://github.com/Sonictherocketman/mygene-api>.

It's available from [PyPI](#) as well:

```
pip install mygene-api
```

Some basic examples:

- Find a given gene with the id: CDK2.

```
""" Use the query API to find a gene with
the given symbol.
"""
from mygene.gene import Gene

results = Gene.find_by(q='CDK2')
for r in result:
    print r._id, r.name

>>> 1017 cyclin-dependent kinase 2
12566 cyclin-dependent kinase 2
362817 cyclin dependent kinase 2
```

(continues on next page)

```
52004 CDK2-associated protein 2
...
```

- Given an known gene, get it's begin and end coordinates.

```
""" Use the annotation API to find the full
details of a given gene.
"""
from mygene.gene import gene

gene = Gene.get('1017')
print gene._id, gene.genomic_pos_hg19['start'], gene.genomic_pos_hg19['end']

>>> 1017 56360553 56366568
```

- This library also supports the metadata API.

```
from mygene.metadata import Metadata

metadata = Metadata.get_metadata()
print metadata.stats['total_genes']

>>> 12611464
```

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## CHAPTER 5

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### How to cite

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## CHAPTER 6

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### FAQ

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See FAQ page here: <http://mygene.info/faq/>



## CHAPTER 7

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### Related links

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- [mygene.info on Github](#)





## CHAPTER 8

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### Contact us

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- [help@mygene.info](mailto:help@mygene.info)
- [@mygeneinfo](#)